A.S.E. Source at 1550nm for IFOG Applications

Quarterly Progress Report

Period: 3/5/98 to 6/5/98

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To whom it may concern,

Enclosed is a copy of the quarterly progress report for the A.S.E. Source at 1550nm for IFOG Applications contract.

Sincerely,

Benjamin Ellerbusch

Benjamin P. Ellerbusch
Graduate Student

BPE

Enclosed: 1 copy

Project Title: A.S.E. Source at 1550nm for IFOG Applications

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1. Loss measurements for the undoped alumina waveguides have been completed for both the 980nm and 1550nm wavelengths. Losses range from 0.8dB/cm to 1.2dB/cm for both the 1550nm and 980nm wavelengths.

2. A new straight waveguide mask has been designed and fabricated in an effort to improve the smoothness and uniformity of sidewalls on the ridge waveguides. Wear and tear on the old mask had caused its performance to deteriorate resulting in rough edges and thus higher loss. Initial results show that there is a slight decrease in the waveguide losses with improved uniformity in etched waveguides fabricated using the new mask.

3. Another step taken to reduce waveguide losses is to reduce the index difference between the guiding layer and the cladding layer. We are planning to reduce this difference from about 0.15 to 0.05. This smaller index difference necessitates more gradual bends when curved waveguides are being designed, but should reduce losses in straight waveguides. These new waveguides with smaller index variations will hopefully be ready for loss measurements in the near future.

4. Very high coupling losses of 10-15dB per fiber-to-facet interface have been measured making it difficult to couple more than 30mW of pump power into the waveguides. These high losses also make it very difficult to achieve net gain in the system.

5. Two steps have been taken to decrease these coupling losses; the first being the use of tapered, or lensed, fiber which has been fabricated in-house using an etching technique found in

the literature. Initial results show that this etching technique yields smooth tapers which will improve coupling. The second step taken was to increase the alumina guiding layer thickness from 0.5um to 1.0um thus improving the shape of the mode and increasing the mode size. Once these new guides have been fabricated, new coupling loss measurements will be done.

6. The result of the addition of Lanthanum codoping on luminescence lifetime is uncertain. Results show an slight increase in lifetime (+0.5ms) for some samples and a slight decrease in lifetime in others (-0.5ms). The Lanthanum also causes a change in the luminescence spectrum resulting in more peaks and decreased uniformity. Lifetimes of 3.0ms to 5.0ms have been measured both with and without Lanthanum doping. These lifetimes are for samples containing 0.05%-0.5% Erbium doping levels. It is expected that a reduction in Erbium doping level below 0.05% would further increase the lifetime and increase efficiency, but also decrease the gain per unit length.